Exam: EVEN_SEM_ESE_25-26 | Course Year: FY B Tech | Show | Clear

Regular — Start Date : 6/20/0026 12:00:00 AM — Upto Date : 6/22/0026 12:00:00 AM

Backlog — Start Date : 6/20/0026 12:00:00 AM — Upto Date : 6/22/0026 12:00:00 AM

Subject List for Photo Copy

Subjects
Engineering Mathematics - I
Basic Mechanical Engineering
Engineering Mathematics-II
Industrial Chemistry
Basic Electrical Engineering

Que	Que Marks	Obt. Marks
Q.1 A)	1	N
Q.1 B)	**1**	**1**
Q.1 C	**1**	**1**
Q.1 D)	**1**	**1**
Q.2 A)	6	N
Q.2 B)	**6**	**6**

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Question No 1

Q1 A) Ignition temperature is the minimum temperature heated to a fuel which ignites the fuel

Q1 B) One Drawback of solar energy :-
It does not work in cloudy conditions
It requires constant light energy to produce electricity.

Q1 C) Calorimeter works on the general principle of Law of Conservation of Energy.

Q1 D) GCV (Gross Calorified Value) or HCV is the heat measured by burning 1g or (1kg) of fuel.

GCV = LCV + (0.9 × H × L)
where
LCV = Lower Calorified Value
H = % H is solvent
L = Latent Heat

Question No. 2

Q2 B) The six main hurdles in transportation and storage of Hydrogen gas (as a fuel)

i) Hydrogen Gas is very light :-
As the hydrogen gas is very light it is hard to compress it in the container.

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ii) It is highly flammable :- H_2 gas is highly flammable as one mistake can cost everything so it has to be carried with more precautions.

iii) It is hard to compress hydrogen gas as the is liquid because to convert it into liquid we have to freeze it at very low degree in (−).

iv) Transportation Cost :- As to keep it in liquid form we need big tools for keeping it at lowest temperature till the destination which increases the cost of transportation.

v) Hydrogen gas contains moisture which sometimes goes into small areas of tankers, etc. which causes corrosion faster as it has moisture present and may cause cracks in tankers, etc.

vi) Hydrogen gas corrodes the metal faster ∴ Maintenance fees cost more

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Question No. 3

Q3 B) Given,

Let,
weight of coal sample (W) = 22.5g
weight of coal after removing moisture (W_1) = 2.15g
weight of coal after removing volatile matter gases (W_2) = 1.25g
weight of ash left (W_3) = 0.20g

Formulas :-

% moisture = $\frac{W - W_1}{W} \times 100$
= $\frac{\text{Change in wt of the removing moisture}}{\text{weight of coal}} \times 100$

% volatile matter = $\frac{\text{change in wt of coal}}{\text{wt. of coal}} \times 100$

% ash = $\frac{\text{weight of ash}}{\text{weight of coal}} \times 100$

Sol^n :-

% moisture = $\frac{W - W_1}{W} \times 100$
= $\frac{22.5 - 2.15}{22.5} \times 100$
= $\frac{20.35}{22.5} \times 100$
% moisture = 90.44 % approximately

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% volatile matter = $\frac{W_1 - W_2}{W} \times 100$
= $\frac{2.15 - 1.25}{22.5} \times 100$
= 0.04 × 100
% volatile matter = 4 %

% ash = $\frac{W_3}{W} \times 100$
= $\frac{0.20}{22.5} \times 100$
% ash = 0.89 % approximately

Q3 C) Fuels are classified into 2 types on the basis of Occurrence

Natural Fuels	Artificial fuels
They are naturally obtained in the nature	They are processed fuels, Natural fuels are processed here.
eg :- Coal, Crude petroleum, CNG, etc	eg :- Coal is processed to Coke, Crude petroleum to petrol, diesel, biodiesel & CNG to LPG, CNG, etc.

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Fuels are classified in 2 types on basis of reaction occur

Chemical Reaction	Nuclear Reaction
The heat produced is due to the chemical reactions that happen	Massive heat is produced in Nuclear reaction
Oxidation, etc happens	Nuclear fusion or Nuclear fission.

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Question No. 5

Q5 A)

b) Stretching Vibration of polyatomic molecules

In this vibration the angle between bond does not change only the ~~bond~~ atoms atoms changes the path length in stretching vibration
There are 2 types of stretching vibration :-
i) Symmetric Vibration :- Where both atoms goes back & forth at same time.

Question No. 4

Q4 A) The two forbidden electron transitions are :-

i) $\pi \rightarrow \pi^*$
ii) $\sigma \rightarrow \sigma^*$

Q4 C) Wavelength region of UV visible radiation is from 600 - 1500 cm^{-1}

Q4 D) Hypsochromic Shift is also known as Blue shift, it is the shift of absorbtion peak towards the lower wavelength means high energy

ii) Asymmetric Stretching Vibration :- Where one atom goes back & another goes forther.

c) Two application of IR :-

i) We can find whether the molecule is diatomic or not for example O_2, H_2, this are diatomic molecule they doesn't cause interaction with radiation & for non-diatomic molecules like H_2S, etc cause interaction with radiation so IR spectroscopy can be determined.

ii) Using Beer-Lambarts law $A = \epsilon \times C \times l$ we can find out the concentration or path length, etc by knowing the other two values.

x) Fingerprint region in IR Spectrum consist of complex spectrums where

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a device like (Prism, etc) chooses one spectrum light from all the colours of light entering and allow only that specific wavelength light to enter through it, it is some like (human fingerprint unlock smartphone - eg for understanding)

Question No. 6

Q6 A) To find degree of vibration
Formulas required :-

For linear molecules :- $3N - 5$
For Non-linear molecules :- $3N - 6$
where N is no. of atoms present in molecules.

For SO_2
It is a linear molecule
(N) No. of atoms = 1 + 3 = 4

$\therefore DOV = 3N - 5 = 3(4) - 5 = 7$

$\therefore$ Degree of Vibration of SO_2 : 7

For C_2H_2
It is Non-linear
$\therefore DOV = 3N - 6$
$N = 2 + 2 = 4$

$\therefore DOV = 3(4) - 6$
$\therefore$ Degree of Vibration = 6

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For NH_3
It is non-linear molecule

$N = 1 + 3 = 4$

$DOV = 3N - 6$
$= 3(4) - 6$
$= 6$

$\therefore$ Degree of vibration = 6

Q6(c) Homonuclear diatomic molecules do not show IR absorbtion because the have identical atoms present i.e. diatomic molecule is present so that the electrons does not get removed and because of that they do not touch the radiation part because of identical atoms present they do not cause vibrational movements which is necessary for IR absorbtion

For eg :- (H_2, O_2, N_2, S_2 ← these identical diatomic molecules does not cause vibration)

Heteronudear diatomic molecules does not contain identical atoms such that they forms bond with another atom causing vibrational energy in the molecules towards the radiation so this vibrational energy can be shown by IR absorbtion.

For eg :- (H_2S, etc)

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Question No. 7

Q7 A) Cathodic protection is contains the object which is to be electroplated using cathode the object is electroplated & protection is present.

Q7 B) Oxygen concentration cell corosion is the corosion which is caused due to excess of oxygen and moisture to the surface of metal where the corrosion rate increase due to oxygen.

Q7 D) Galvanization is the process of coating a metal or steel with zinc such that zinc prevents the corrosion of the material.

Question No. 8

Q8 B) Electroplating is process where the metal is electroplated with zinc ions in a solution using anode clip & cathod clip where $e^{\ominus}$'s are transferred in solution for the metal to be coated.

Process :-
1) Pure metal is connected to anode and at metal to be coated is connected at cathode
2) Anode and cathode are then connected

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to the battery of 9V or more for bigger metals

3) Then the pure metal & metal to be coated is dipped in electrolytic solution then the battery is turned on and the electroplating process starts.

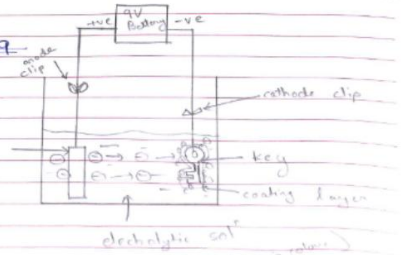
4) After few minutes the coating layer is present on that metal.

eg :- Copper, etc. $\rightarrow Cu + ZnO \Rightarrow CuZn + O_2\uparrow$

The application of electroplating is :-

1) Electroplating of big vessels in boilers, etc
2) Electroplating of keys.

Question 9



Electroplating

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Question No. 9

(9 A) A steel bolt in contact with copper pipe shows severe corrosion
This is a type of dry corrosion or chemical corrosion.

To protect the from the corrosion the ~~steel~~ steel bolt needs to be electroplated such that it will not cause corrosion because zinc will not allow the corrosion to happen

∴ Electrolysis of water or Electroplating can prevent this corrosion.

(9 B) The 3 factors affecting corrosion on the basis of nature of environment are :-

1) Moisture
2) Air or Grases
3) Temperature
4) pH

1) Moisture :- Moisture causes wet corrosion due to it contains water and water can corrodes metal easily
eg: bottom of the ships corrodes faster that upper ship.

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2) Air or Grases :-
Grases causes dry corrosion to the metal. Grases corrosion are generally slower than moister corrosion.
Grases like H_2 can corrode metals ~~more~~ faster
eg: H_2 gas corrodes faster.

3) Temperature :-
High temperature causes ~~more~~ corrosion faster due to the high temperature the layers of zinc can come out faster so it corrodes.

4) pH :-
Low pH also causes corrosion

Question No. 10

(10 B) Mole fraction is the fraction ~~the~~ of moles of A — moles of B divided by Total moles.

Mole fraction = $\frac{N_A}{N_A - N_B}$

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(10 C) Buffer solution is the solution made up of ~~base~~ phenolphthalein, methyl orange, etc.

(10 D) Median = $\frac{N}{2}$ or $\left(\frac{N}{2}+1\right)$

Question No. 11

(11 B) Given,

Total No. of workers (N) = 600
No. of

(11 A) Given

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	$f(x_i)$	$(x_i - \bar{x})$	$f(x_i - \bar{x})$
1	0.45 - f_0	-0.042	
2	0.52	0.028	
3	0.48	-0.012	
4	0.51	0.018	
5	0.49 - f_1	-0.002	
6	0.53 - f_2	0.038	
7	0.47 - f_3	-0.022	
8	0.5	0.008	
9	0.46	-0.032	
10	0.51	0.018	
	Σf_i = 4.92		

Mean ($\bar{x}$) = $\frac{\Sigma (\text{Total no. of frequency})}{\text{Total no. of values}}$

Mean ($\bar{x}$) = $\frac{\Sigma f_i}{10} = \frac{4.92}{10} = 0.492$

Mode = $l + \left(\frac{f_0 - f_1}{2f_0 - f_2 - f_1}\right)$

$= 0.45 + \left(\frac{0.49 - 0.53}{2(0.49) - 0.53 - 0.47}\right)$

$= 0.45 + \left(\frac{-0.04}{-0.02}\right)$

$= 0.45 + 2$

$= 2.45$

Median = $\frac{\Sigma f (x_i - \bar{x}_i)}{\Sigma f}$

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Median = 0.49

~~Mode~~ =

Median = $\frac{N}{2}$ or $\left(\frac{N}{2}+1\right)$

SD = $\sqrt{\text{variance}}$ (calculated on rough)
SD = 0.2218

∴ Median = 0.5 or 0.49

∴ Standard Deviation = 0.2218

∴ Mode = 2.45

∴ Mean = 0.492

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Question No. 12

(12 C) For Case 1
given :-

$N = 200$
$X = 90$
$Y = 110$
$XY = 60$ ← Observed value

Expected (XY) = $\frac{(X)(Y)}{N}$ - Formula

Putting values
$= \frac{90 \times 110}{200}$

∴ Expected value = 49.5

Observed value > Expected value
(Case 1)
∴ It is Positively associated

For case 2
N = 300
X = 150
Y = 160
XY (Observed value) = 70
Expected value = $\frac{(X)(Y)}{N} = \frac{150 \times 160}{300} = 8$

∴ Observed value > Expected value

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∴ Case 2 is also positively associated.

For case 3
Given
N = 250
X = 120
Y = 130
XY = 75 ← observed value

Expected value (XY) = $\frac{(X)(Y)}{N}$

$= \frac{120 \times 130}{250}$

Expected value (XY) = 62.4

∴ Observed value > Expected value

∴ Case 3 is also positively associated

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(Q12) A) Given,

mass of solute (Fructose) = 18g

mass of solvent in kg = 0.18 kg = 180 g

No. of moles = $\frac{\text{Mass}}{\text{Molar Mass}}$

$= \frac{18}{180}$ mol

$= \frac{1}{10}$

$= 0.1$ mol

iii) Molality = $\frac{\text{No. of moles}}{\text{Mass of solvent in kg}}$

$= \frac{0.1}{0.18} \approx 0.556 \frac{\text{mol}}{\text{kg}}$

∴ Molality = 0.556 mol/kg

i) Mole fraction of fructose

Mole fraction = $\frac{N_A}{N_A - N_B}$

N_A = No. of * moles of fructose = $\frac{18}{180} = 0.1$ mol

N_B = No. of moles of H_2O = $\frac{180}{18} = 10$ mol

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Mole fraction of fructose = $\frac{0.1}{0.1 - 10}$

$= -0.01$

ii) Mole fraction of water = $\frac{N_B}{N_A - N_B}$

$= \frac{10}{0.1 - 10}$

$= -1.01$

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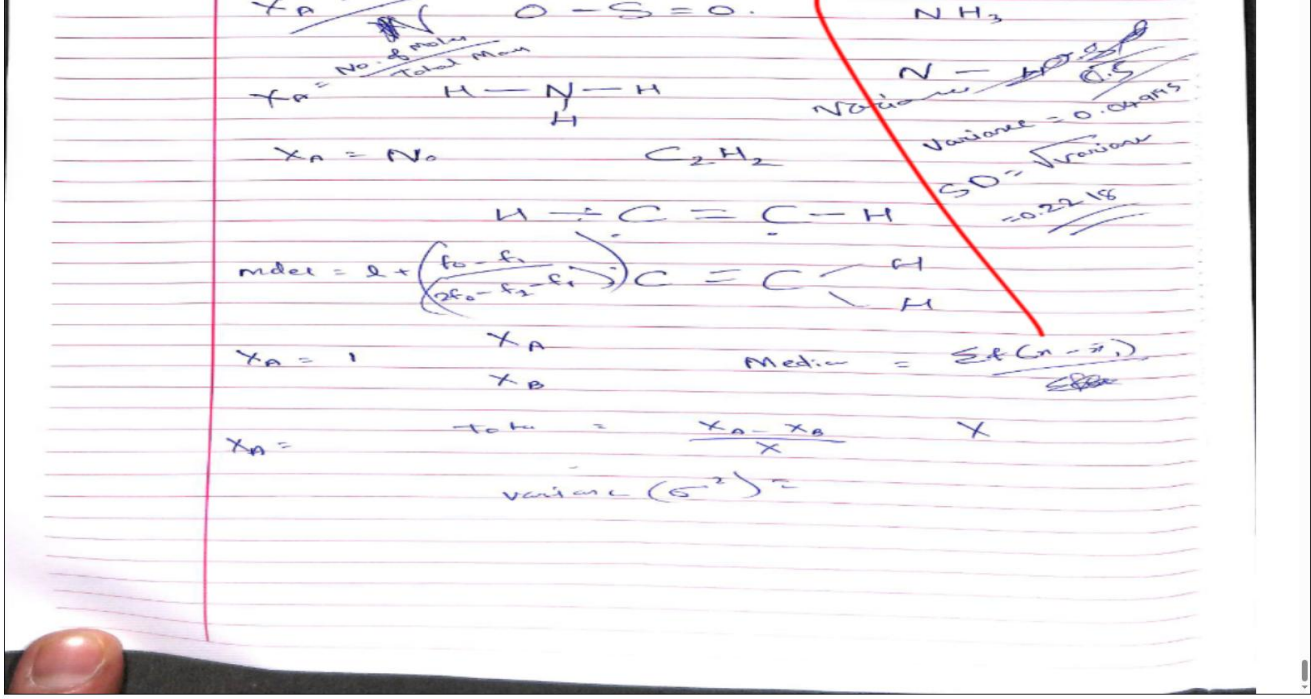
Rough Work

SO_3


X_A = No. of Moles / Total Mass
X_A = N_0
C_2H_2
NH_3
Variance = 0.04875
SD = $\sqrt{\text{Variance}}$
= 0.2206
Median = $\frac{X_A - X_B}{X}$
Variance (σ^2) =